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13 November 1984

USSR Report

TRANSPORTATION

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BELAZ-7519, 75191 QUARRY DUMP TRUCK SPECIFICATIONS

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 5, May 84 p 35

[Article by L. I. Dobrykh, M. F. Shumskiy, N. K. Kryzhanovskiy: "Technical Specifications of BelAZ-7519, 75191 Quarry Dump Trucks"]

[Text] The new products of the Belorussian Automotive Plant, the dump trucks BelAZ-7519 and BelAZ-75191 [photo omitted] of 100-110 t capacity with 4 x 2 wheel arrangement, are designed to carry rock and other loose loads from strip mines. The trucks are intended for use on specially-designed roads with hard cover, withstanding an axle load of at least 1,300 kN, with a lengthwise tilt of not more than 80 percent, and for work in conjunction with excavators having a bucket capacity of 12.5 m^3. The technical capabilities of these trucks can be assessed from their specifications.

During the course of operational testing, done in tandem with dump trucks BelAZ-549B of 75 t capacity, it was found that the productivity, for example, of the BelAZ-7519 is 1.5-1.6 times better than that of the BelAZ-549B.

Specification	BelAZ-7519	BelAZ-75191
Mass, t:		
payload	110	100
fully-equipped truck	85	84.5
total	195	184.5
Fully-equipped mass applied to the road, t, by the:		
front axle	44	43
rear axle	41	41.0
Total mass applied to the road, t, by the:		
front axle	65	61.5
rear axle	130	123
Maximum engine power, kW	956	809
Maximum speed with full load, m/s(km/h)	13.9(50)	13.9(50)
Minimum turn radius along the front outer wheel rut (relative to the turn center), m	not more than 12	not more than 12
Dimensions (overall), mm:		
length	11,250	11,250
width	6,100	6,100

[Table continued on following page]

Specification	BelAZ-7519	BelAZ-75191
height:		
at the body overhang	5,130	5,130
at the raised body overhang	10,900	10,900
Base, mm	5,300	5,300
Wheel gage, mm:		
front	4,900	4,900
rear (between the middles of the twin tires)	4,125	4,125
Minimum road clearance, mm	740	740
Cabin volume (geometrical), m^3	44	39.5
Cabin capacity, m^3	59	54.5
Time for raising loaded body with the engine crankshaft turning at 1,450-1,500 rpm, s	not more than 19	not more than 19
Time for lowering of body, s	not more than 18	not more than 18
Brake path of truck with full load at speed of 30 km/h up to full halt, m, when using:		
the main brake system	not more than 21	not more than 21
auxiliary brake system	not more than 30	not more than 30
Standard fuel consumption per 100 km at speed of travel 30-35 km/h, l	420	490
Fuel tank capacity, l	1,000	1,000
Level of internal noise in cabin, dBA	not more than 84	not more than 84

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GREATER ATTENTION TO BRIDGE MAINTENANCE, REPAIR URGED

Moscow AVTOMOBIL'NYYE DOROGI in Russian No 5, May 84 p 4

[Article by V. E. Kubasov, engineer, Rosdororgtekhstroy [All-Union Highway Construction Department]: "Bridge Maintenance Must Be Improved"]

[Text] In recent years motor vehicle traffic has substantially increased and transported tonnage has risen sharply on the roads of the country. Correspondingly, loads that affect the roads and structures have increased.

Under these conditions, road maintenance organizations which are charged with keeping roads under their jurisdiction in satisfactory condition are acquiring more and more importance.

Although, as a rule, necessary maintenance and current repairs on the roads are done, the situation with road structures is much worse. In part this situation can be explained by straight forward reasons: the absence of bridge specialists in the maintenance organizations and the absence of necessary materials and equipment. It must be noted, however, that many road construction and repair organizations look after the condition of bridges and overpasses in an extremely unsatisfactory manner. Even simple jobs not requiring large material and labor expenditures frequently are not done.

In their inspection of bridges and overpasses, Rosdororgtekhstroy bridge-testing units often come across defects which could have been avoided or defects whose effects could have been reduced. These defects lead to the premature removal of bridge components from use and to the overall reduction of the structure's lifespan. Much more needs to be provided to repair these bridges than to maintain them in operating condition.

One of the common maintenance defects is the breakdown in water drainage. Inattention to linear and transverse roadway grades and to blockages (even those caused by asphalting) in run off pipes has produced standing water on bridges and its filtration through the road surface.

This water-proofing defect, which is common, leads to the leaching of the concrete slabs of the roadway and bridge span beams. According to data from a series of tests, in conditions like this concrete loses its structural strength completely in 20 years on average. Leaching of reinforced concrete

span structures which is related to water run-off defects has been observed in 75 percent of the inspected bridges.

Another typical defect encountered in practically all bridges that have been in use more than 10 years is excess asphalt-concrete cover on the roadway. The longer the bridge has been in use, the thicker this excess roadway covering, that can reach a thickness of 20 cm and more. Thus, an additional permanent load not allowed for in design calculations burdens the span structure. At the same time, in the technical code for repair and maintenance of motor vehicle roads VSN 24-75, the following is stated: "In the repair of asphalt-concrete and concrete roadway and sidewalks, the worn pavement layer is cut out and replaced by new pavement. The overall pavement thickness should not exceed design dimensions by more than 10-15 percent" (paragraph 10, 1, 17). Unfortunately, this requirement is very rarely carried out in practice.

Usually, in pavement repair the new layer of asphalt concrete is laid over the existing pavement. Current pavement repair on bridges has not produced positive results because the pavement patching quickly cracks and breaks off due to structure vibration, in addition to which pavement smoothness after repair leaves much to be desired.

Sometimes one can find a very different picture where pavement repair on bridges has not been done for many years, and the roadway has broken up so much that it reminds an observer of a bumpy country road. One can come across bridges whose pavement contains potholes that extend to the protective coating of bridge reinforcements which are subjected to additional dynamic stress by the vehicular traffic. As a consequence of this, the roadway slabs of such bridges show chipping and cracking of concrete.

Functional movement joints require more attention. Recently, a number of new types of joint construction have made their appearance, and in them to a substantial degree the shortcomings of the old methods have been eliminated. However, on existing structures there are many movement joints that do not satisfy contemporary requirements. Their normal functioning depends in large measure on their cleaning and timely repair. Unfortunately, this is not always done. In about 40 percent of the bridges inspected, movement joints are in unsatisfactory condition and almost none of them have water runoff chutes. As a result the temperature induced movement of span structures is impeded, and dirt together with water falls onto the foundation surface and support sections through the movement joints. There are bridges whose support sections are covered with a half-meter layer of caked dirt.

The falling dirt negatively affects not only the condition and operation of the support sections, but also the supports themselves. The dirt impedes free air movement around the supports and contributes to a moisture build-up, as a result of which surface breakdown of the concrete takes place. One often can see on these supports the traces of leaching.

Metal corrosion is very common on metal bridges. The main reason for this is the absence of metal preparation for painting (rust removal and removal of old paint, mineral oils, etc.). Because proper painting procedures are not

followed, the adhesion of the covering paint is insufficient, and the new coat easily peels and does not fulfill its protective function.

Maintenance organizations do not fulfill the requirements of VSN 24-75 about regular measurements of water depths under bridges. Such information would make it possible to discover erosion and to take preventive measures against erosion around supports.

Of all the everyday bridge maintenance jobs, the only one that is done more or less regularly is the cleaning of the roadway portion. However, even this job is often carried out with violations. Refuse is usually removed through water runoff pipes or through movement joints both of which are unacceptable, because in the first instance on metal bridges the refuse often falls onto the lower sections of the span structure and in the second, it falls onto the foundation platforms.

I would especially like to say something about technical plans and data on bridges. In most cases its availability is very limited, especially for bridges put into use in the 1950's and 1960's. Several bridges have no documentation other than a file-card on the bridge, and sometimes they don't even have a card. Even the information on the cards does not always correspond to reality (an example would be not entering modifications after bridge reconstruction). Certainly when the question of structure repair arises, design, utilization and correctly done maintenance documentation can make the job much easier.

Much has been said often in the past about these shortcomings enumerated above and about many others pertaining to the maintenance of structures. In addition, a number of normative-technical documents exist that define bridge and overpass maintenance procedures.

In the recent past measures were taken directed towards improving the work efficiency of bridge and overpass maintenance organizations. However, improvement has come extremely slowly. Bridge engineers and a sufficient number of bridge foremen are not yet available in all highway maintenance organizations. Specialized work brigades established for bridge repair are often diverted to other jobs.

Bridge maintenance in comparison with road maintenance continues as in the past to be of secondary importance; this is unacceptable. For it is certainly true that a bridge taken out of operation has incomparably more serious consequences than the loss of a highway section.

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RAILWAYS FIRST DEPUTY MINISTER ON FOODSTUFFS TRANSPORT

Moscow SEL'SKAYA ZHIZN' in Russian 12 Jul 84 p 2

[Article by M. Zarayev: "From Field, to Freight Car, to Granaries"]

[Text] The title of this article was the topic of a talk with USSR Deputy Minister of Railways V. N. Gin'ko that was devoted to organizational problems in the transportation of agricultural products.

This conversation on the pages of SEL'SKAYA ZHIZN' took place at the end of the last government grain procurement season. While acknowledging the justice of many of the grievances raised by representatives of various APK's [agro-industrial complex] against railroad personnel, V. N. Gin'ko made justifiable complaints to industry branch managers who are responsible for inordinate railcar idle time, inefficient hauling practices and at times even backhauling of cargo.

Among these branches is the one responsible for grain collection. V. A. Anikin, deputy minister for grain collection forwarded answers to questions put to him by the editorial staff. He reported about measures taken that made it possible to raise the level of grain shipment block routing this year to 30-35 percent. Much has been done in the grain collection branch to mechanize the loading and unloading of cars, and over the last 2 years more than 1,000 receiving-discharging units were introduced, two-thirds of which are suitable for bulk grain carriers. An extensive program of operations is envisioned before the end of the five-year plan.

However, what kind of pay-back do such measures provide? In fact, the main criterion here is the reduction of freight car idle time in freight operations and the reduction of the gap between the real and the planned freight car stay on a branch line, or as specialists describe it, excess freight car idle time.

"Over 5 months of this year this idle time was reduced by 0.11 hours in comparison with a similar period of time last year," it was reported at the Ministry of Procurement.

Speaking candidly, this achievement is not very comforting when you consider that it is the norm for cars with grain to stand on branch tracks 3.07 hours

and stand idle at discharge platforms of grain receiving enterprises an average of 4.17 hours. Eleven one-hundredths in contrast to those data is an insignificant figure.

The backhauling of grain and flour arising as a result of a shortage of flour milling capacity in a number of areas in the country remains a severe problem. This capacity is especially lacking in Kazakhstan, Central Asia and the Transcaucasus, while in the Central European areas of the country there are surplus facilities. At present, improvement of the material and technical base of the flour milling and groats industry and the building up of its capacity in areas where there is a shortage of mills is continuing. The timetable for the reduction of backhauling depends on the degree of efficiency with which these operations are carried out. The Ministry of Fruit and Vegetable Industry does not promise a radical improvement in the efficiency of this hauling this year. Deputy Minister P. P. Volkov reported to the editorial staff that the development of a general system for the efficient transportation of fruits and vegetables by all types of transport was being completed, and that it would serve as a basis for the creation of systems for the normal running of the cargo flows.

V. V. Pavlov, a deputy department chief of USSR Gosplan, has written about the importance of such an approach to the task. Centralized management in the delivery of coarse fodder is necessary. It is a fact that every year the railroads haul from 500,000 to 3 million tons of straw from procurement areas to areas where this fodder is not in supply because of weather conditions, and this leads to backhauling and excessive long distance hauling. An interdepartmental commission on improving the efficiency of cargo hauling attached to USSR Gosplan proposed that the Ministry of Agriculture develop plans for coarse fodder procurement so that the fodder deliveries could be made to consumers in nearby areas.

In Gin'ko's talk "From Field, to Freight Car, to Granaries" the yearly practice of hauling by rail millions of tons of sugar beets distances of 10 and 20 kilometers was discussed. This practice leads to repeated cargo transfer and delay. Comrade Pavlov reported that back in 1981 Gosplan of the Ukrainian SSR prepared proposals on switching the hauling of 4 million tons of beets from rail to truck and on closing 68 station beet-receiving facilities. However, the implementation of these proposals has been dela ed because of the shortage of fuel and labor resources in the truck trans rtation system and also because of the absence of local paved roads at t farms concerned.

However, it is still true that resources are being expended on delivery of beets all the same, even if it is railway transport that's being used here. Why not redistribute the resources the way they should be allotted? Certainly it was possible to build paved roads in the years that have passed since the introduction of these sensible proposals.

The responses that were sent to the editorial staff once again bear witness to the immediate need for a comprehensive approach to the solution of the problem of raising the efficiency of agricultural cargo hauling.

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USSR, SPAIN PLAN S&T COOPERATION IN RAIL SECTOR

Moscow GUDOK in Russian 16 Jun 84 p 3

[Article by V. Chernoivanov: "USSR-Spain: Rail Cooperation"]

[Text] The signing of the summary report of the second meeting of rail representatives from the Soviet Union and Spain concerning questions of scientific and technical cooperation between the two countries took place in Moscow at the Ministry of Railways.

Soviet-Spanish rail cooperation began in 1983 with the establishment of a joint Soviet-Spanish commission on scientific and technical cooperation, called for in documents signed in Moscow on 27 October. Agreement on the principles of Soviet-Spanish rail cooperation was reached on 17 November 1983 in Madrid where the USSR Ministry of Railways delegation traveled.

On 9 June 1984 a delegation from the National Railroads of Spain (RENFE) headed by its president Ramon Boixados Male arrived in Moscow.

A broad variety of questions interested our Spanish guests. They were discussed at a reception given by the Minister of Railways N. S. Konarev and also at meetings with Soviet rail workers of Moscow, Kiev and Leningrad.

Reciprocal proposals for cooperation and coordination of the arrangements for cooperation for 1985 and themes for cooperation for the period 1985-1990 were, in particular, discussed. Also, possibilities of establishing direct rail communication between Moscow and Madrid were discussed. In addition, the place and time for the third meeting of Ministry of Railways and RENFE representatives were selected.

The Spanish delegation visited the Shcherbinka station where they learned about the experimental ring of the All-Union Scientific-Research Institute of Railway Transportation. Soviet colleagues demonstrated rolling-stock and rail testing on the ring. In Leningrad the guests examined a car-laboratory for measuring the parameters of the contact system of the October Rail Line.

The Minister of Railways of the USSR N. S. Konarev and P. B. Male, president of RENFE, expressed the hope of broadening and strengthening scientific and technical cooperation between railroad men of the Soviet Union and Spain.

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ALL-UNION S&T RAILROAD CONFERENCE HELD IN DNEPROPETROVSK

Moscow GUDOK in Russian 10 Jul 84 p 3

[Article by A. Brynza, candidate of technical sciences, Lecturer, DIIT (Dnepropetrovsk Institute of Railway Engineers): "All-Union Scientific Conference"]

[Text] An all-union scientific conference on the problems of the mechanics of rail transportation took place at the Dnepropetrovsk Institute of Railway Engineers imeni M. I. Kalinin. The conference was organized by the Ministry of Railways, DIIT, the Dnieper Scientific Center and the Institute of Engineering Mechanics of the Academy of Sciences of Ukrainian SSR.

More than 50 scientific-research and teaching institutes and transportation enterprises were represented at the conference.

The Ministry of Railway's Chief Inspector For Traffic Safety Yu. A. Tyupkin mentioned a series of concrete tasks in his speech that confront scientists and specialists who deal with railroad mechanics.

One of the most important problems, the improvement of freight car design, was discussed at the conference. The Director of the All-Union Scientific-Research Institute of Rail Car Construction, winner of the USSR state prize, A. I. Rechkalov noted that for rail car builders to resolve the freight car problem, they must first turn to the production of cars with enhanced carrying capacity, having a track load of up to 25 tons on each wheel pair. Such an increase in load on the track is scientifically sound and is based on recommendations in the latest edition of standards for rating and designing rail cars. Doctor of Technical Sciences S. V. Vershinskiy reported about these and other features of the new standards.

The development of rail car designs, as we know, is a complex scientific and engineering task. The car must be durable, stable at high speeds and suitable for use over a long period of time. The selection of design parameters in full-scale tests is very expensive. Therefore, testing for high speed stability, incidental vibrations and fatigue strength and evaluating the effect of rolling stock on track on mathematical models have generated much interest. This testing by means of mathematical modeling substantially reduces the amount of full-scale testing and it speeds up the design process.

Several years ago at the Moscow and Dnepropetrovsk institutes of railroad engineers, the Ural Rail Car Plant and a number of other organizations initiated the development of an automated design system for freight cars (SAPR-GV) was undertaken. The results of the research in this area were reported at the conference. At present several SAPR-GV sub-systems are already in operation. They make possible the automatic development of design data and plans for several types of freight cars. The introduction of SAPR in rail car construction will permit a substantial reduction in the time needed for creating and introducing future designs.

As far as locomotive construction is concerned, the development and production of prototypes of a divided 19-axle alternating current electric locomotive of the VL85 type are outstanding achievements. One of the developers of the locomotive, Deputy Director of the All-Union Research and Development, Planning, Design and Manufacturing Institute for Electric Locomotive Construction, USSR state prize winner V. Ya. Sverdlov reported on this. Its traction and braking characteristics and its efficiency substantially surpass those of the eight-axle series, and the VL85 has no equal among electric locomotives the world over. Production is slated to begin in 1986-1987.

Much attention at the conference was devoted to questions connected with the development of ways and means of moving superheavy and superlong trains. Experience in moving them has shown that particular features of specific track sections and the continually changing position of the train require the controlling of forces that arise in the train. For example, when a superheavy train is brought to a stop, powerful forces can be generated which are capable of destroying a car or disengaging it from the rest of the train.

In several talks given at the conference it was noted that at the Dnepropetrovsk Institute automated systems had been developed and proposed for the automated operation of locomotives of superheavy trains. Also, operation charts for moving these trains on certain rail line sections, drawn up with computer assistance (subject to power constraints), were developed and proposed.

More than 150 talks were heard at the conference. They stimulated lively discussion and a useful exchange of opinion. A resolution was adopted which outlined the tasks and the ways to solve them.

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FUTURE TRENDS IN SOVIET LOCOMOTIVE DESIGN, TECHNOLOGY

Moscow ELEKTRICHESKAYA I TEPLOVOZNAYA TYAGA in Russian No 7, Jul 84 pp 34-37

[Article by V. F. Kulish, chief, Department of New Electric Locomotives, Main Administration for Locomotive Operations, Ministry of Railways: "Future Electric Locomotives"]

[Text] The conversion of sections with the heaviest freight loads to electric traction is a most important means for further increasing the traffic and carrying capacity of railroads. By the end of the current five-year plan about two-thirds of all traffic will be on electrified lines, which account for only one-third of the system's total length. The following sections will be electrified: Karymsk -- Khabarovsk, Monity -- Chu, Kazan and Central Siberia, Tyumen -- Nazyvayev, the eastern section of BAM and others.

Further increases in train weight through the use of multi-unit electric locomotives and increases in unit power are given great importance for increasing the carrying capacity of existing electrified main lines. Passenger operations will also be developed, with trains increased to 24 - 32 cars.

Characteristics of Electric Locomotives

These tasks can be handled only through the development of the locomotive fleet. There are therefore provisions to almost double electric locomotive production even during the current five-year plan. Also, the MPS and the Electrical Engineering Industry have worked out the characteristics for electric locomotives of more than 10,000 kW (see Table 1.). The exceptional importance of this should be noted, as it defines the quantitative and qualitative indicators of locomotive production.

In working out these characteristics a study was made of research and development on the basic parameters and designs of rolling stock, conclusions were drawn from domestic and foreign experience in building thyristor locomotives and consideration was given to the rich experience of shop workers in selecting the optimal parameters and making repair decisions.

The new characteristics are based on the use of 4 and 6 axle sections with increased power per axle. There are provisions for sectioning. There will not be multi-unit operation of passenger and freight locomotives running on dc or

with dual current systems. Thanks to the complete standardization of rectifier and tractor motor axle blocks it will be possible to have two axle hook ups if necessary. This will also be helped by the fact that future locomotives will consist of two identical sections working in multi unit systems. In combination with a telemechanical control system developed by VNIIZhT [All Union Scientific Research Institute for Railroad Transportation] this will create extensive possibilities for rolling stock use.

Table 1. Design Characteristics

Type of Electric Locomotive	Traction Motor Suspension	Type of Electric Motor	Type of Electric Braking	Multi-unit Capability
VL80S	Bolster-axle	Commutator	Rheostatic	Yes
VL80R	" "	" "	Regerative	No
VL84	Bolster-frame	" "	Regenerative	Yes
VL85	" "	" "	" "	"
VL86	" "	Non-commutator	" "	"
Ch8	" "	Commutator	Rheostatic	No
VL10U	Bolster-axle	Commutator	Regenerative	Yes
VL11	" "	" "	" "	Yes
VL14	Bolster-frame	Commutator	" "	Yes
VL15	" "	" "	" "	In planning stages
VL16	Bolster-axle	Commutator with impulse regulation	Rheostatic	No
Ch7	Bolster-frame	Commutator	" "	No
VL82M	Bolster-axle	Commutator	Rheostatic	"

As can be seen from the table, there will be continued production of the VL10U and VL11 dc freight locomotives, the ac VL80S and VL80R, the dual current VL82M and passenger electrics, which will be built prior to the mastery of more powerful and modern locomotives.

One should note that the need to very rapidly increase train weight on a number of routes make it very important to produce VL80S's working in 3 and 4 section sets and to build SMET devices -- telemechanical systems for multi units. These will be installed on VL80T's and VL10's at shops.

The dc VL14 and ac VL84 are future 8 axle locomotives. They will replace present models on those sections where train weights do not require more powerful locomotives. There will also be electric locomotives with more than 1.5 fold the power of those now produced. These are the 12 axle ac VL85s with commutator motors and the VL86 with non-commutator motors and the dc VL15s.

For the first time the model assortment includes a dc electric switching and road locomotive. It is proposed to use it as the base for subsequent models for ac sections. It is intended to provide autonomous power sources -- batteries or diesels -- for their operation on nonelectrified track.

The assortment includes two powerful new 8 axle passenger electrics: the dc ChS7 and the ac ChS8. Their chassis components are standardized with the mechanical components of ChS6 electrics, while the main electrical equipment is similar to that used on the ChS2T and ChS4 respectively.

In selecting one hour ratings, tractive effort and speed consideration was given to the possibility of attaining traction capabilities depending upon adhesion conditions and estimated and maximum train speeds. This was based on maximum permissible speeds at optimal axle loadings with regard to impact on track and running gear components. The optimal axle loading on rails was set at 25 tons-force [tf]. This has been sufficiently tested for its impact on rail wear, mechanical component reliability and increased tractive effort. This is the limiting load for switch points using R65 rails under trains moving at established speeds and for the standardized elements of wheelsets.

Research has shown that increased loading does not always mean growth in attainable tractive effort. It is therefore reckoned that the one hour rating for ac electric locomotives should be 5.5 - 6.5 tf and for dc, 5 - 6 tf. Locomotive one hour ratings were determined on the assumption that speeds on grades will not exceed 50 - 55 km/h. For ac locomotives these ratings are 950 - 1200 kW and for dc 850 - 900 kW.

It should be noted that after the introduction of systems for the independent excitation of traction motors and the use of asynchronous machines, one can expect a 10 percent increase in tractive effort without motor overheating. It will also be possible to increase speeds on grades. This is included in the parameters for traction motors with bolster-frame suspension. Thus, for electric locomotives with asynchronous motors, attainable tractive effort will increase to 6.5 tf and speed to 60 km/h.

Because of electric locomotives' high energy consumption and the great importance now given to electrical energy conservation, for the first time the characteristics include an energy indicator: the efficiency factor for continuous ratings. For switching and road electric locomotives these parameters are set by the need to move full weight trains, using either external or autonomous power sources and to use external power to move made up trains on schedules parallel to freight ones.

The characteristics of ChS7 and Ch8 passenger locomotives mainly depend upon the parameters of their traction motors, which are similar to those now used in ChS2Ts and ChS4Ts. However, it should be kept in mind that the motors for the ChS4T will also be substantially modernized. As a result, motor power will increase to 900 kW, without changing the 106 km/h design speed. It is later foreseen to increase motor power in the ChS6 to 900 kW and to increase it in the ChS7. This will involve the removal of the compensating winding and reductions in hourly rotation.

Table 2

Characteristics of Future Electric Locomotives

Назначение	Тип	Осевая формула	Нагрузка от оси на рельсы, тс	Power kW / Мощность, кВт: часового режима	Power kW / Мощность, кВт: длительного режима	Tractive Effort, tf: часового режима	Tractive Effort, tf: длительного режима	Speed km/h / Скорость, км/ч: часового режима	Speed km/h / Скорость, км/ч: длительного режима	Speed km/h / Скорость, км/ч: конструктивная	Continuous operation efficiency factor, not less than
1	2	3	4	5	6	7	8	9	10	11	12
Переменный ток 25 кВ (25 kV ac)											
Freight	ВЛ80С	2 (2о-2о)	24	6520	6160	45,1	40,9	51,6	53,6	110	0,84
"	ВЛ80Р	2 (2о-2о)	24	6520	6160	45,1	40,9	51,6	53,6	110	0,84
"	ВЛ84	2 (2о-2о)	25	7600	7200	50,0	46,0	54	56	120	0,86
"	ВЛ85	2 (2о-2о-2о) или 2 (3о-3о)	25	10 000 11 400	9200 – 10 000	72,0	66,0	50	51	120	0,86
"	ВЛ86	2 (3о-3о)	25	12 000	11 000	75,0	67,0	54	55		
Passenger	ЧС8	2 (2о-2о)	20 – 21,5	—	7200	—	24,6	59 —	61 106	120 180	0,84 –
Постоянный ток 3 кВ (3kV dc)											
Freight	ВЛ10У	2 (2о-2о)	25	5360	4500	39,5	32	48,7	51,2	100	0,88
"	ВЛ11	2 (2о-2о)	23	5360	4500	39,5	32	48,7	51,2	100	0,88
"	ВЛ14	2 (2о-2о)	25	7040	6400	46	40	54	56	120	0,88
"	ВЛ15	2 (2о-2о-2о) или 2 (3о-3о)	25	9000 10 560	8400 – 9600	69	63	46	47	120	—
Autonomous power source	ВЛ16	—	21 – 22	4200 (autonomous) 1200 – 1500	4000	37	32	54 42	56 47	120 100	0,88 0,85
Passenger	ЧС7	2 (2о-2о)	20 – 21,5	—	6160 – 7200	—	21,6	—	87,8 – 106	180	—
Электровозы двойного питания (Dual Current)											
Freight	ВЛ82М	2 (2о-2о)	25	6040	5760	42,4	40,0	51	51,6	110	0,86/0,9

Key:
1. Function
2. Type
3. Axle arrangement
4. Axle loading on rails, tf
5. One hour rating
6. Continuous rating
7. One hour rating
8. Continuous rating
9. One hour rating
10. Continuous rating
11. Designed speed

The advisability of these changes will be evaluated from the results of testing the first group of ChS7 electrics and experimental ChS8s delivered in 1983.

We will examine the basic design decisions planned for the development of locomotives in the new model assortment.

Mechanical Part

The basis for further improvements in the mechanical part is the development of running gear with bolster-frame suspension of traction motors. This is the most effective means for reducing the unsprung truck and chassis components' dynamic effect on track, as it cuts unsprung weight almost in half. It also means improved reliability for motors and locomotives as a whole. This is central in designing the mechanical part.

Because it isn't easy to produce such drives, in the first stage bolster-axle suspension will be used on the condition that after the development of designs and manufacturing technology for bolster-frame drives for VL84 electrics they will be installed on all series. This will make it possible to replace chassis components.

The running gear for all electric locomotives will be formed from two axle trucks. However, in view of the difficulties of building 6 axle units from three 2 axle trucks, 3 axle trucks will be used. In spite of the operating difficulties of swing bolster (pendulum) suspension of bodies, it was decided to retain it on future locomotives after modernizing it on the basis of acquired experience. There are important changes in the system for transmitting tractive forces: instead of a pivot system with devices for additional loading it is planned to use inclines.

Because of the extensive use of spiral springs for spring suspension, they are planned to be installed in the first stage. This requires the development of reliable hydraulic shock absorbers. Considering that work has just begun, initially it is more probable that leaf springs will be used for primary suspension. Great attention is given to the use of wear resistant parts in running gear to eliminate the need to rebuild parts prior to plant repairs. Simultaneously, there will be improvements in gear housings and supports. Chassis components and parts will be standardized.

To assure the operation of trains weighing 8,000 and more tons, the frames of the 6 axle sections will be built for loads of 300 tf. Envelope style frames like those for 8 axle locomotives will be used. Some decisions still remain outside the bounds of the model assortment. However, in view of the considerable outlays for electric locomotive production and maintenance and for the development of shops, great attention will be given to the development of 8 axle single section locomotives, primarily for passenger service.

Prior to the transition to 8 axle single section passenger locomotives it is intended to further improve the mechanical part of 2 section 8 axle

locomotives based on the chassis for ChS6 and ChS200 electrics. There will be more reliable hydraulic shock absorbers, two sets of springs, silent blocks for journal boxes and reduction gear suspension and improvements in traction drives.

Traction Motors and Auxiliary Machinery

In accordance with the electric locomotive production sequence one can distinguish three stages in traction motor improvement. The first task is the development, based on NB-418K6 and TL-2K1 motors, of new, higher torque motors with high speed ratings equal to the older ones. This work is now being completed. The NB-514 and TL-3B motors have been developed for installation on 12 axle electrics. Later, bolster frame traction motors exceeding 800 kW dc or 900 kW ac will be developed. The design and the materials and techniques used should assure operation without the replacement of insulation throughout their entire service lives. Their prototypes are the motors installed in two experimental VL84s.

Further improvements entail the use of more moisture resistant monolithic insulation, improved techniques for building sections of armatures and coils, the use of protective coatings for magnet systems and housings. Also, there will be more heat resistant connections between commutators and armatures and dynamically stable commutator designs with no arch support forces. The latter innovation will not only increase the commutation capability of traction motors, but will also permit the development of components not requiring commutator reassembly and tightening.

Noncommutator motors will replace commutator models. The development time frames for power transformers and reliable control systems will determine the beginning of the transition to these motors. This work will be in two stages for passenger electric locomotives. Initially power will be increased to 900 kW, making a number of improvements, then noncommutator motors will be installed, first of all in dc electrics. Two variants are under development: up to 800 kW without a reducer and up to 1000 kW with one.

Improvements in future locomotive energy indicators and reliability depend to a considerable degree upon auxiliary machinery. Therefore basic attention will be paid to such machinery on freight electric locomotives.

It is essential to improve the design and manufacturing technology for AE-92-402 motors and to later convert to the more powerful ANE-225 motor, which includes refinements on the AE-92-402. Both motors will be used to drive ventilators, compressors and as phase splitters. In order to reduce electrical energy use, special two speed motors for powering ventilators in summer and winter conditions might be developed.

Considerable potentials for reliability improvements in dc locomotives and machinery and for reductions in ventilator energy consumption are being opened up by the transition to low voltage (440 V) dc motors supplied from static transformers. Losses are compensated by the regulation of ventilator

productivity depending upon tractor motor temperatures. Static transformers are also planned for supply to field windings during traction. This will prevent wheelset slipping and reduce sanding.

Improvements in ChS7 and ChS8 passenger locomotive auxiliary equipment call for the use, on all drives, of a standardized 440 V dc motor supplied from standardized thyristor controls. Motor r.p.m will change depending on traction motor loads and ambient temperatures. These measures will not only reduce electricity consumption but will also improve locomotive reliability in winter conditions.

Electrical Equipment

The use of improved thyristor converters with more optimal circuits and high parameter semiconductors is the main change in the electrical part of ac and dc electric locomotives. Initially use will be made of standardized converters, based on VL80P converters, using 3 kV recurrent voltage thyristors with a continuous rating of 500 A. This will permit a 1.25 fold size reduction while retaining current and voltage capacities. Energy indicators will also be improved.

In the next stage there will be improvements in standardized converters through the use of impulse phase regulation (RIF).

Further improvements in converter parameters will be attained through the use of higher class semiconductors with more effective coolers. Thus, 40 class diodes will be installed on the 8th series of ChS4T (62E8) and the 8 axle ChS8. This will considerably simplify servicing and improve repairability and reliability. Later it is planned to use thyristor controls. This will make it possible to convert to noncommutator power circuits and eliminate commutation equipment.

Improvements in converters for supply to traction motor excitation circuits, control and auxiliary equipment are directed towards the development of new high parameter thyristors and towards organizing the production of better capacitors. Their appearance will make possible standardized converters for dc switching and freight electric locomotives. The Stremberg firm (Finland) is now working on a converter for ac locomotives and the Skoda Plant (Czechoslovakia) on one for dc passenger units. It is intended to produce experimental units in 1984 - 1985.

An important role will be given to the improvement of electronic control systems for converters and electric locomotives. This will enhance their reliability and repairability, improve control automation and provide for multi-unit operation. Automatic systems for controlling some operations, mainly rheostatic and regenerative braking have found widespread use on the following presently produced electrics: VL80S, VL10U, ChS2T, ChS4T, ChS6 and ChS200. The use of thyristor converters will permit the automation of electric locomotive control during traction.

One can expect substantial changes in dc locomotive control systems. This will be based on the telemechanical system for controlling multi-unit systems

developed at VNIIZhT. Great importance is placed upon the automation of ventilation systems depending upon loads and ambient air or equipment and traction motor temperatures.

Main and high speed circuit switches are also being modernized, making use of vacuum chambers, high speed drives, dischargers and high capacity nonlinear components; low specific loss steel will be used in transformers. Moreover, thyristor technology will simplify these components.

A lot of attention is given to improving locomotive crew working conditions. It is planned to install air conditioners in cabs and to take measures to protect crews from injury during collisions or derailments. Special electric circuit debugging devices are to be installed.

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ADVANTAGES OF MICROCOMPUTER CONTROL FOR LOCOMOTIVES

Moscow GUDOK in Russian 11 Aug 84 p 2]

[Article by A. Vol'vich, chief, Department of Digital Control Systems and Computer Technology,VE1NII [Possibly: All Union Electric Locomotive Scientific Research Institute, candidate of technical sciences:"Microcomputers in Electric Locomotives: What Will They Do?"]

[Text] The domestic electric locomotive building industry is working intensively to improve freight locomotive designs and to create more powerful and productive machines. This is because increases in train weight are the most effective way for improving haulage capacity. However, the possibilities for growth in locomotive tractive effort and power are limited by allowable wheel pressure on rails and adhesion factors. The limit for power per wheel-set, about 1,000 kW, has been practically reached.

However, due to a number of specific reasons, this power is not completely utilized. Electric locomotive power can be increased through two mutually complementary ways: increases in the number of powered axles and through the creation of devices and methods permitting locomotives to rapidly adapt to changing conditions so as to make maximum use of their rated power.

It is effective to increase the number of axles. However, due to design considerations it is impossible to build an electric locomotive with a very large number of axles under a single unit as it will not negotiate curves in the track. Neither is it economically advantageous to build multi unit locomotives because of the high cost of multi unit hook-ups and automatic couplers. In addition, the operation and servicing of a long electric locomotive will be more difficult. It is therefore of great economic importance to efficiently use the rated capacity of an electric locomotive.

The present level of control systems development makes it possible to solve this problem through the installation of control computers in electric locomotives. What functions will these computers perform? Above all they will control transformer and converter units, which will be their output devices. The effective use of electric locomotive traction capabilities requires the even loading of all traction motors on a main line locomotive, no matter how many their are, without slippage or skidding during braking. To handle this task it is essential to have a highly accurate knowledge of loadings per motor. There are not yet instruments for measuring this.

Control computers in electric locomotives should not only perform complicated calculations but also remember them for a long time. Then the engineer will not have to look at the ammeters showing the current in motor armatures and manually eliminate the reasons for skidding. In the event of adhesion problems, the control computer gives the transformers commands to reduce tractive effort.

During movement, adhesion conditions constantly change, depending upon a whole series of factors. All of them still must be taken into consideration by engineers. Some have a lot of experience and can therefore more efficiently operate trains. Others have less. Control computers can learn from the best experience. They will assure train movement along a given section with minimal electrical energy use and strict maintenance of schedules.

Also, computers will select optimal working conditions for electric locomotive auxiliary equipment, especially ventilators, controlling them in dependence upon main tractive equipment temperatures. This is important as it will save up to 60 percent of the electrical energy used by a locomotive for its own needs, or up to 10 percent of that used for pulling trains.

What are the prospects for using computers to control electric locomotives? Why are they not yet on domestic or foreign produced electric locomotives? The main difficulty is that they must be installed near the main power equipment as they are linked to the transformers by a large number of wires. This means that they must be in a high voltage compartment, requiring them to withstand severe cold, tropical heat, strong vibrations and be breakdown resistant.

Industrial computers do not yet meet these requirements. Novocherkassk electric locomotive builders are developing specialized control computers. They have tested prototypes in an experimental locomotive. Design work on computers for series produced locomotiver is continuing.

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RAIL SYSTEMS

CHIEF ON PROGRESS OF AUTOMATED CONTROL FOR RAILWAYS

Moscow GUDOK in Russian 10 Aug 84 p 2

[Article by Yu. Khandkarov, chief, Ministry of Railways Main Administration for Computer Technology: "How is Automation Developing?"]

> [Text] The discussion "Computers -- a Reserve for Management" has already included articles by L. Tulupov (25 May), Yu. Vaynshetyn (1 June), Yu. Bylinskiy (7 June), Ya. Lembrikov (19 June), V. Liberman (27 June), A. Pisarev (11 July) and B. del Rio (17 July). The editors are still receiving letters on ways of more effectively using computer technology.

Technically and organizationally, the ASUZhT [Automated Management System for Railroad Transportation] is being developed as a three level information processing system. The Main Computer Center for the Ministry of Railways (GVTs MPS) has been set up, line computer centers (DVTs) are functioning on all rail lines and automated systems for the major switchyards (ASUSS). have been and are continuing to be developed. The ASUZhT includes 19 subsystems. However, because of limitations with regard to developer and hardware, priority is on the main subsystems involving the control of operations.

Research and experience show that for the automation of operational control over transportation, each line needs its own hardware. In real, or close to real time, it should assure the collection of initial data from primary documents at their compilation points. These data must be transmitted to centers for the automated processing of information (TsAOI) so that the results will be given to all operating personnel who need them.

We consider solutions to these problems our most important task and are attempting to reach them in the process of creating a material and technical base for the ASUZhT. During the time the MPS Administration for Computer technology has been in operation 12 TsAOI have been set up and data transmission systems (SPD) built for 8 railroad lines. Another 8 TsAOI, a building for the GVTs MPS and 6 SPD are in the construction stage.

Thanks to the attention of the ministry and USSR Gosplan over the past 10 years, the fixed capital for computer operations has increased 4 fold. This includes a 140 percent increase in the last 2 years. This made possible a [illegible] fold growth in DVTs work volume. All rail lines now have modern third

generation computers. A considerable number of communication channels between DVTs and line enterprises have been allocated, <u>22</u> rail lines obtained powerful new computers, telecommunications equipment and hundreds of data transmitting units. However, as the MPS Board has justifiably noted, the return from this hardware is still clearly insufficient.

The existing communications systems at lines permit the collection of initial data from all switchyards, sections and locomotive shops and reports of inter-line train transfers from many stations. In many cases all this requires is the reallocation of channels between users. By the end of 1985 it is planned to have the minimum essential material base for the basic task of the ASUZhT -- the operational control train movements (ASUDO) [Possibly: ASU for Rail Line Operations]. The further development of ASUZhT requires increased capital investments to strengthen the communications system and equip line units with automated work facilities.

It is quite understandable that automation's "center of gravity" is now in operational control. However, it was not immediately possible to use computers here. In the 1970's, due to hardware shortages, specialists were long unable to develop a system capable of working in real time. Only on the Belorussian Line, thanks to the creative initiative and cooperation of specialists from the DVTs and other services with electronics industry workers, all under the direct leadership of the line chief was the first ASUDO developed. True, this was based on a second generation computer. This system used a number of atypical devices, but it did provide solutions to the major functional tasks of controlling train and freight operations, and this is the main thing.

In December 1981 the Belorussian experience in the improvement of operational control with the help of computers was examined and approved by the MPS Board, which passed a decree on the dissemination of this initiative throughout the network. The efforts of the ASUZhT PKTB [Planning Design and Technical Office], the Belorussian Line Computer Center, VNIIZhT [All-Union Scientific Research Institute for Railroad Transportation] and DVTs should be combined and a standard system created. However, having jointly prepared technical targets for ASUDO with unified functional and technical solutions, Belorussian and ASUZhT PKTB specialists have not found unity on special problems: tele-processing, data bases, forms for primary reports and their diagnosis.

The main administration has now shown the necessary firmness. Having decided that it is better to have two program alternatives for ASUDO than to stop development.

Thus, there were two alternative programs for the same system. Time was lost. In the process of working on the PKTB VNIIZhT for the Northern and later the October and South Urals lines a number of serious shortcomings were revealed. Together with oversights in preparatory work at lines these caused delays in the systems' introduction and failure to meet the MPS Board's targets.

The situation is now beginning to be corrected. ASUDO are being introduced on 8 lines, at another 4 lines the system has been put into experimental

operation using a single division as testing ground and at 11 lines introduction will begin this year. The remaining lines will obtain ASUDO hardware in 1985 - 1986. However, even this year we can begin solving problems in the automated control over loading and unloading. These tasks are being handled with existing computers and data transmission systems. By 1986 ADUDO should be operating on all the most important routes in the system.

We have now found and coordinated technical solutions to information compatibility for alternative systems operating on the Belorussian Line and developed by PKTB ASUZhT. A working group of specialists from the Belorussian and Moscow Lines has been organized to develop standardized programs for ASUDO. The group also includes specialists from PKTB ASUZhT and GVTs MPS.

In order to accelerate the design of automated systems and improve their quality, the main administration is planning to strengthen the PKTB ASUZhT through the concentration of developers in several DVTs. The goal is to develop ASU by industrial methods, following capital construction titles. Specific tasks for the development of ASUDO functional potentials and their introduction sequence at lines were precisely defined by Order No 24Ts of 20 July 1983 and the MPS directives of 1 June 1984. Our common efforts should be directed towards assuring the timely completion of targets.

The next problem concerns ways of improving ASU efficiency. So far the greatest effect from the use of computers by railroads has been obtained from the Ekspress-2 system, from automated data processing systems set up at yard accounting offices, for compiling statistical reports on line transportation and operations and for material supplies. The conversion of this work to computers released more than 3,600 people.

And yet the efficiency of ASU has still not had a great impact in the management of the transportation process. The reason is that an ASUDO has not been completely introduced on a single line, including the Belorussian. Even many switchyards at which ASU have been operating for several years have still not mastered a number of tasks in the second stage.

The main thing now is to completely introduce the systems, with a step by step coverage by large system testing. The deputy chiefs of traffic services for ASU and the deputy chiefs of line division traffic departments for ASU have major roles here.

The effect from ASUDO will be significantly higher when line workers see the real advantages from technical measures, when there are more results from their work and their psychological and physical work loads are reduced. We frequently attempt to "squeeze out" ever more detailed information from line workers, giving nothing in exchange. This means we must automate primary data inputs. Now that industry has mastered the mass production of microprocessor equipment capable of automating the compilation of primary documents, we must accelerate its widespread use.

The universal introduction of microprocessors, possible even in the 12th Five-Year Plan, will radically transform the entire system of current

statistical record keeping in railroads and will improve labor productivity. System efficiency can also be improved through computer assisted solution of traditional transportation problems and problems still solved manually. The main administration is taking additional measures to do this.

There are other reserves for improving ASUDO efficiency -- improving the reliability and timeliness of train information transmitted from stations. To do this, in the next five-year plan it is intended to supply automated work facilities to all stations forming trains.

GUDOK has already reported that computer operations workers are now ASU clients and contractors. They must also operate systems. These functions should obviously be separated. Sector main administrations and services should become the clients. They should also be made responsible for the rational use of ASU.

In our opinion the time has come to develop new indicators for DVTs and GVTs operations so that computer hardware becomes more vital. Bonuses to computer collectives should depend directly upon their influence on the main work indicators of lines and transportation in general. It is advisable to differentiate the pay of DVTs managers, depending upon the automation levels of main operations on lines.

In conclusion I want to stress that the essential organizational and technical base has been created for the further development of ASUDO. Of course, additional equipment is needed for the automated collection of initial data from primary documents and their transmission from line units to the DVTs. In the future we are faced with preparing scientific and technical programs for the further development of the ASUZhT.

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SCIENTISTS ON EFFECTS OF HEAVIER, LONGER TRAINS

Moscow GUDOK in Russian 21 Aug 84 pp 2-3

[Interview conducted by Lidiya Vichkanova, special correspondent; date not specified, held at editorial offices]

[Text] How and when is a tendency born? We have become witnesses to a long awaited one: For the first time in its history, our country's railroads achieved their entire planned growth in haulage without increasing the number of trains, but through an unprecedented increase in average train weight. This should become a tendency to be strengthened and developed. It has a future. Practical work can not handle such a difficult task without the help of science. We are not talking about the traditional movement of heavy trains based only on the engineer's skill to squeeze all the reserves of power and adhesion from a locomotive, but about a new technology. Just how can science help, what are its suggestions for mobilizing the efforts of transportation science for a general solution to urgent problems so that heavier and longer trains can move on all routes where they are now needed? GUDOK editors invited the following to discuss this theme: Al'bert Nikolayevich Bevzenko, chief, Main Technical Administration, Aleksandr Leonidovich Lisitsyn, director of the All Union Scientific Research Institute for Railroad Transportation and Igor' Petrovich Isayev, doctor of technical sciences and professor at the Moscow Institute for Railroad Transportation Engineers. Our article covers the discussion at the editorial offices.

A. N. Bevzenko: First of all, I would like to say what has been done, for without the help of science, heavy trains would not be moving on the Moscow, Tselin or other lines. To begin with, science has long supported the need to make major advances in increasing train weight and length. If we examine developments by VNIIZhT, beginning in the 1970's, we see a consistently advanced concept stating that the strategy for increasing haulage should change and that increased train weight, not numbers should prevail.

A. L. Lisitsyn: One should also add that the institute showed that lines doing the main part of the system's work are, or have already reached traffic

saturation and that further attempts to increase the number of trains there will only lead to reductions in section speed. The institute's developments and proposals were approved, but in practice the strategy did not change. As before, they attempted to cram more and more trains into overloaded sections, while train weight increases were insignificant. Finally, during the 10th Five-Year Plan, all attempts to increase traffic had practically no results, they only reduced section speed by 10 entire percentage points during the five-year plan. This was the system average, on a number of routes it was even greater.

Only in December 1982 did the MPS Board state the need to move from words about a new strategy for increasing haulage and make the transition to decisive action.

A. N. Bevzenko: The basis for these decisive moves was experience on the Moscow Railroad. From the very beginning workers were helped by scientists from VNIIZhT and MIIT [Moscow Institute for Railroad Transportation Engineers]. This experience is quite well known. I want to stress only its fundamental aspects. The Muscovites broke the bounds of traditional movement for heavy trains. In the first stage, when they started to form 6,000 ton trains pulled only by head end locomotives, they decisively avoided the usual caution about the length of yard tracks. Theymastered the problem and showed everybody many ways of getting around these difficulties. In the second stage, forming 10,000 ton trains, they used two locomotives at different points in a train, connecting them to the brake lines. This latter is a very important factor.

We have previously attempted to move 10,000 ton trains on our lines, in particular on the Sredsib [Central Siberian] Railroad. We took a lot of knocks. At that time brake equipment was not able to avoid longitudinal dynamic forces in trains from building up to dangerous limits. Since then, thanks to scientific and design work, we have improved air distributors, composition brake shoes, brake valves with VA positions, 418 transponders and reliable brake hose connectors with increased rotation angles.

In general, brake equipment has improved. The Moscow method's technological innovation consists of connecting the brake line of a 10,000 ton train and in controlling brakes from a locomotive at each end of the train. This substantially reduced the effects of air line leaks and speeded up line charging. Braking became smoother and longitudinal forces were reduced.

When the Muscovites showed that it was possible to control the brakes on a long train from two separate locomotives, the temptation arose to make up even larger trains pulled by more locomotives. This idea was tested on the Gudermes - Orsk and Ekibastuz - Tobol Lines. Once again, practical workers were assisted by scientists: Doctor of Technical Sciences V. G. Inozemtsev, a well known brake specialist, L. A. Muginshteyn, a brake and traction specialist, and others. Not a single step towards increasing train weight and length was made without scientists' advice and help. They also looked for answers to basic questions: What levels of longitudinal forces can be allowed, where are the best places to put locomotives and how can they be better controlled.

It has already been found that tension and compression forces in a train can be kept within allowable limits even with train weights of up to 16,000 tons. Obviously, braking, taking up slack and uncoupling should be in accordance with operating rules worked out especially for a given section and through the use of radios to coordinate the actions of engineers in locomotives located throughout the train. This is already in the instructions. It is used on various lines and will be even more widely applied.

Prospects for increasing haulage up to 1990 and 2000 have now been determined. It turns out that the main increases in freight flows will be on lines which are already loaded. We could not handle the increase with heavier trains.

I. P. Isayev: Here you are talking about the year 2000 and what is being planned to use heavy trains in the future. However, can one really think about this without developing lines in the existing system. That wouldn't be right.

A. L. Lisitsyn: There is a plan for line development. It makes provisions for constructing additional bypasses around regions with heavy traffic and for increasing carrying capacity. It is intended to introduce new equipment, automation, increase the fleet of eight axle cars, etc. When we say that 60 percent of growth should be through greater train weight and length, this means that 40 percent will be through the development of carrying capacity. The program for increased freight turnover should be balanced.

A. N. Bevzenko: We must invest each ruble so that we will most rapidly obtain the greatest utility for increasing transport operations. The Moscow Railroad has shown that the combination of new technology with the skillful use of capital investments can have a good effect. It performed 18.5 million rubles worth of work, mainly on lengthening side tracks. It did everything on its own and in the way it should be done. This work was precisely focused and cleared the way for new technology for the formation and movement of heavier and longer trains.

We expect a lot more from science to further expand the use of heavier trains. Above all we need equipment for the remote control of helper locomotives. This equipment should be based on contemporary electronic components and new principles. Above all, it is felt that locomotives in a long train should all operate synchronously. However, when a train stretches four kilometers, there are doubts about this principle. All this should be thoroughly studied and taken into account for remote control.

The parallel use of several weight norms on the same sections complicates the locomotive fleet's regulation, especially where there are lots of branch lines. We are waiting for scientists to give us programs for computer aided fleet regulation.

Together with scientists we will continue experiments on superheavy trains, as we call rolling stock weighing more than 16,000 tons. Such trains are in fact needed. There are routes especially intended for the bulk haulage of coal, coke and ore directly from the extraction and preparation sites to consumers. The technology for super heavy train operations must be mastered, as it is useful.

A.L. Lisitsyn: We are all in the habit of talking about train weight, but we should also talk about length. There are many routes where it is not coal or ore, but lighter freight that predominates. This traffic is in zones with saturated capacity. The dispatch of double or triple rolling stock hauling combines, lumber, grain or even cotton is just as important and, in all regards, just as effective as if the train were carrying coal or ore. They weigh less, but the effect is the same. Moving a larger number of freight cars in fewer trains is therefore a task which is now being posed. Then, in addition to increasing freight turnover we will also improve qualitative indicators: speed and schedule observation and create conditions for maintaining transport equipment in constant working order.

I.P. Isayev: However, if such a long rolling stock carrying combines arrives at a station, will it stretch out over crossings and block everything?

A. L. Lisitsyn: This will happen if we stick to the present technology. New tasks and new operating systems should give birth to new technology. Technology has first place in the problem of increasing train weight and length.

A. N. Bevzenko: The Muscovites have also shown this. Their long trains have not held up everything at crossings, nor have they stopped traffic. On the contrary, they have raised speeds and improved schedule observation. They have made it possible to increase the numbers and improve the timing for track repair "windows".

This even applies to day to day maintenance work, which is now done mainly with the help of machines. Previously, the track was in unsatisfactory condition. Because of the extreme traffic density, maintenance of way workers worked manually "under the wheels" and there were not enough workers.

I.P. Isayev: The interaction between track and heavy freight trains still requires study. A rolling stock of 3,000-4,000 tons is one thing, but a 40,000 ton one is quite another.

A. L. Lisitsyn: This problem is being studied by our scientists and those at MIIT and other institutes. However, if we will properly select traction so as to optimize loading and if possibilities are created for the mechanized maintenance of rail gauge, then track conditions will not deteriorate. A system of maintenance of way machinery has been created, the matter lies with industry. It is mandatory that this problem be solved.

The locomotives pulling longer and heavier trains should operate at power limits with regard to motor heating and adhesion. Slippage and skidding, wearing down protection from overloads are not permissible. Good methodologies have been worked out and there is modern equipment, including computers, for establishing proper locomotive loadings. If loadings are optimal, there is no increase in damage to locomotives or track.

I. P. Isayev: The reliability of freight cars, especially axle and journal box components, is a very important question. The ratio of the number of bad ordered cars to bad ordered electric locomotives is very large.

A. N. Bevzenko: Increased demands are being made upon car reliability because in such trains each axle failure is more dangerous. The conversion to roller bearings considerably lessens the problem's urgency. Transportation is now getting an unlimited supply from industry. It was decided to first modernize journal boxes on gondolas, as they work under the most difficult conditions.

A. L. Lisitsyn: Great hopes are placed upon the diagnostic apparatus for automatic car inspection being developed by the Urals Division of VNIIZhT. The task is to reveal defects in most car components when cars arrive at a station. If I am not mistaken, inspectors must now look at 130 places on a car in 30 seconds. This is unreal! In praise of the Urals scientists it should be said that they have enlisted physicists and electronics engineers into their research. The problems are being solved at a completely different level.

I. P. Isayev: The interaction between traction and energy supply acquires new features with the presence of several electric locomotives in a train. Measures are needed for additional power supply. Neither can we forget non-traction consumers connected to substations. We are obligated to give them stable voltage, in spite of our heavy trains.

A. L. Lisitsyn: Scientists from VNIIZhT and VUZ's are developing many alternatives for strengthening energy supply. Their use will depend upon specific conditions in sections. The situation is more difficult for those dc transfer lines where reserves are practically exhausted and additional substations will have to be built almost every 5 - 6 kilometers. This is not the answer. Back in 1972 the institute posed the question of converting such freight routes with difficult profiles to ac. It is posing it again with greater insistence and concern. Unfortunately, much time has been lost. Now everybody realizes that this should have been done long ago. If this work had begun earlier, there could have been a gradual conversion of freight routes to ac. This would have been almost painless for operations.

In addition to these problems I would add that of train radios. The reliability of locomotive radios is almost the most important element in traffic safety. It is through their use that engineers in locomotives located at different points in a train can coordinate their actions. Radio is also the basis for locomotive remote control. The "Transport" System now being developed by the institute and industry will meet all these requirements.

I. P. Isayev: I would like to look at another problem. There are many report and accounting documents in transportations. If one analyzes and draws conclusions from them one can find many reserves even within the framework of traditional operating systems. All mistakes will be revealed: why did a train leave before being made up to full weight or length, why was its movement so poor, why didn't the engineer maintain the required speed, etc? The role of such analysis is more important for heavier and longer trains. How long did freight cars wait while the train was being made up, how long did it take to couple up double or triple trains, how was their route movement, how long did it take to break them up upon arrival and what were the real gains from heavier trains? All these questions are very important in determining the effect from new technology and in improving it.

But who will analyze this avalanche of data? Operating workers have their own problems. Not all of them know how to analyze the data and do not have a methodology. We have 15 transportation VUZ's and one doctor of science for every 250 people. VUZ teachers and students are the people who, together with workers at depots, divisions and administrations can give substantial help in finding the most effective conditions for operating heavier and longer trains.

A. L. Lisitsyn: What you say is very important. In particular, this coordination of research efforts is now urgently needed to provide scientific guidance for those routes where freight flows make it essential to introduce longer and heavier trains. Here is what is specifically in mind. A working group consisting of workers from VNIIZhT, MIIT and main administrations prepares a system model indicating the number and routes of heavy trains, suggests the disposition of traction, basic methods for improving energy supply, etc.

This model is sent to lines, which are attached to specific VUZ's. Together with their scientific patrons from VUZ's, railroad workers examine the part applying to their section and using a definite, unified methodology collect and process data on everything necessary for implementing the proposals. They also develop specific technology. All this is returned to the ministry for generalization. Thus, we will create a balanced, interlinked technology for making up and moving longer and heavier trains on all routes where they are now needed.

[Lidiya Vichkanova] This was the discussion at the editorial offices. It pointed out that in the difficult minutes of the birth of a revolutionary technology for moving trains of unprecedented weight and length, scientists put on workers' coveralls and labored together with practical workers. It also showed the readiness of science, together with practical workers, to answer all questions presented by this technology.

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WORK OF RIGA RAILCAR BUILDING PLANT

Tallinn MOLODEZH' ESTONII in Russian 29 May 84 p 2

[Article by Kh. Lootus, assistant engineer at the Tallinn Depot: "Electric Locomotive Flying Forward!"]

[Text] Each of us is far from indifferent to the equipment we are involved with, that is, what machine tool we operate and behind the controls of what vehicle we sit. For this reason, it is understandable why I, an assistant locomotive engineer, would so want to know more about the new electric locomotives. When in Riga, I made a special visit to the Riga Rail ar Building Plant where these are produced.

This is a major enterprise of the sector going back almost 100 years. During the last years of the previous century, the Phoenix Railcar Building Plant (as it was then called) produced freight and passenger cars, tank cars and flatcars. Even then the plant employed 3,500 men.

At present, the plant is scores of buildings where the labor and ideas of thousands of workers and engineers are turned into electric and diesel trains and streetcars. During a year the plant produces 60 electric trains (incidentally, they are produced only in Riga), 250 streetcars and 12 diesel trains.

Since the start of the 1960's, our TEZ [Togliatti Electrical Engineering Plant] imeni M. I. Kalinin Production Association which produces thyristors has been collaborating with the Riga railcar builders.

The electric trains made in Riga travel the railroads not only of our country but also the socialist countries. Recently, for example, an order was fulfilled for the Bulgarian railroad workers, and next their colleagues from Yugoslavia.

What will the electric trains be in 10-15 years? At the end of the 1980's, a new generation of them will appear of the ER-24 and ER-30 types instead of the present-day ER-2. These will be more comfortable with the cars being longer, the doors wider while the interiors will have semisoft seats, daylight lights while the (b of the engineer will be air conditioned.

The ER-9E trains operating on alternating current will also be replaced by new ones, the ER-29, which will make it possible to save up to 30 percent of the electric power. The material from which the brake shoes are made will also be

fundamentally new. At present, during a year up to 30 tons of brake shoes are worn to dust while on the new trains this figure will be reduced to 6 tons. Environmental pollution will thereby be reduced by more than 80 percent.

The last innovation of the Riga railcar builders is the ER-200 train which will reach a speed of 200 km an hour. The train will consist of 14 cars designed for 800 passengers. In March, regular runs for it started on the Moscow--Leningrad route. This is shown in the photograph [not reproduced].

In October of this year, Estonia will celebrate the 60th anniversary of the start of service of the first electric train. This consisted of just 300 cars for 220 persons. Now we have more than 180 km of electrified railroads. Each year evermore modern, high-speed trains appear on them and these trains are interesting and pleasant to work on.

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ELECTRIFICATION EXPERIMENT YIELDS PROMISING RESULTS

Moscow GUDOK in Russian 22 Jun 84 p 2

[Interview with V. Korzhenetskiy, chief of the section for Electrification and Power System from the Smolensk Division of the Moscow Railroad, by S. Semenov from Smolensk: "Contact! There Is Contact!"; date of interview not given]

[Text] The order and response followed almost simultaneously. On the Vyazma--Krasnoye Line of the Smolensk Division of the Moscow Railroad for the first time in the network an alternating current was supplied with a voltage of 2x25 kilovolts. This event occurred a little more than 4 years ago. A good deal of time. Conclusions can be drawn from the operating experience. For this reason, I asked V. Korzhenetskiy, the chief of the Section for Electrificatioin and Power System of the division:

[Question] What problems did electrification solve?

[Answer] Mainly the problem of labor resources and let me explain. On lines with a voltage of 25 kilovolts the maximum distance between the traction substations is around 55 km. Where traffic is particularly intense, for example on the main run of the Smolensk Division, the substations would have to be built 35 km apart. Each of these would have to be manned by personnel and for this reason housing would have to be built along with the building of the substation. The 2x25 system makes it possible to place the substations almost 100 km apart. Between them are autotransformer points which do not require constant servicing. As a result of the 100-km leg, some 30 power workers can be freed.

There is one other indisputable advantage of the 2x25 kilovolt system and that is voltage stability in the contact grid. As a consequence, it does not have limitations in terms of throughput capacity. On any profile consists weighing 5,000-6,000 tons can be operated with it. In speaking about passenger traffic, the 2x25 system will make it possible to bring the consist links to 24-32 cars.

[Question] At the outset of developing the new equipment have unforeseen complications arisen?

[Answer] It could not be otherwise. It is impossible to provide for everything in a plan, regardless of how remarkable it is. For instance, specialists from Transelektroproyekt [State Design-Research Institute for Designing Railroad Electrification and Power Installations] proposed simultaneously supplying voltage to the power and contact wires. With such an approach the damage to a power wire would disrupt the power supply for the trains.

This seemed unreasonable to us. The designers asserted that the separate connecting of the wires went beyond the requirements of safety procedures. But we gave enormous attention to this. It might be agreed that in one's own apartment it is dangerous to climb up on a stool to change a burned out light bulb. Suddenly the stool leg breaks. Ultimately our arguments prevailed. Now on all lines with a voltage of 2x25 there is a separate system for connecting the power and contact wires.

The 4 years of operating the Vyazma--Krasnoye section have shown that alternating current of 2x25 kilovolts significantly reduces the influence of the traction network in the linking device. And this means that expenditures on calibrating are sharply reduced.

The operating of the line with a voltage of 2x25 kilovolts of alternating current in the Smolensk Division annually produces a savings of 195,500 rubles.

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PROGRESS REPORT ON KLAIPEDA-MUKRAN RAIL FERRY PROJECT

Moscow GUDOK in Russian 18 Jul 84 p 2

[Article by GUDOK correspondents L. Lyubimov and N. Davydov, Klaipeda--Rimkai: "Shore--Sea--Shore; Construction Has Started on the Unique Rail-Ferry Crossing Between the USSR and GDR"]

[Text] In terms of its technical facilities, this will be a transport artery as yet unequaled in the world. More than 100 cars will be located simultaneously on the double-deck ferry. All loading and unloading operations at the ports of Klaipeda and Mukran (GDR) which link the ferry bridge should be carried out in unprecedentedly short times. In 4 hours the arriving rolling stock will be taken off the ferry and assembled at the port station while their place will be taken by the other rolling stock already ready for dispatch. The entire trip from Klaipeda and back will take 2 days! This is several times faster than the turn-around of the freight trains now across the main rail line through Poland.

For receiving and processing the cars arriving for the crossing, in March of the current year not far from Klaipeda they began building the port station. The scope of the work can be judged from the fact that in virtually 2 years (in the autumn of 1986), its first stage should be in operation with the receiving-dispatching and marshaling yards. All in all, this is 12 km of main track and 55 km of other track.

Naturally, it was not easy even to select the territory suitable for such a major project, particularly close to such a major industrial center as Klaipeda. Certainly the designers from Lengiprotrans [Leningrad State Design-Research Institute for Transport Construction] had to consider the proximity of the unique sanctuary area on the Kursh Spit as well as the fishery inspection requirements and much else. Ultimately they chose a territory near the Rimkai Station. But when the necessary amount of track had been calculated and incorporated in the plans according to the designated ferry operations, it turned out that a portion of the future Rimkai Port Station would be located unacceptably close to the city water intake facilities.

The required shifting of the tracks involved the need to lengthen the peninsula into the Kursh Bay on which the piers were to rest. And the quarry for fill had to be shifted farther from the water intake zone.

The general contractor for the foreport station is the Balttransstroy [Baltic Transport Construction] Trust and, in particular, its SMP-711 [construction-installation train]. Here a barely sufficient front has been established for laying the track and building the other installations. And the work could be carried out much faster than is being done now. The fill for the station tracks is delivered from Kaliningrad Oblast and from the local Gargzhday Quarry.

There is also the possibility of hauling fill in from Daugavpils. For this, Balttransstroy would have to install an excavator and assign a dump-car circuit train. The leaders of the Baltic Railroad promised to provide one. But for some reason the construction workers have not employed this approach. And fill is received irregularly from the nearby Gargzhday Quarry where the work is being carried out by the Mechanized Column No 6 of the Tsentrstroymekhanizatsiya [Central Construction Mechanization] Trust from Belorussia (chief, A. Tochenyy). The Baltic Railroad has sent two circuit trains here consisting of 15 flatcars each. According to the established schedule, each of them should make two trips a day. However, less is done. And in the quarry there are not two but only one excavator.

We arrived at Gargzhday after 1000 hours. The excavator had been idle since the day before. The operator A. Muroveyko and his assistant were busy with repairs. At the same time, even the appearance of the excavator eloquently showed that for its constant work there would have to be on duty a repair team with specialists. In the meanwhile the two circuit trains were standing on the track.

Incidentally, nearby we saw another excavator. In truth, it was half-dissembled. One could only be amazed at the mismanagement of the mechanized column's leaders. Instead of repairing the excavator in the shop, they had left it in the quarry where there were neither tools nor spare parts.

Recently the First Deputy Chief of Glavzheldorstroy [Main Administration for Railroad Construction] of the North and West, Yu. Petrov, arrived in Klaipeda. It was as if everything had been coordinated and all operations scheduled down to the minute. But, as we see, the smoothness remained only on paper. And the circuit trains stood idle for days.

All the same the chief of the SMP-711, A. Adamavichus, is optimistic. He feels that "in any major construction project, problems initially are inevitable. One must make oneself at home, adjust and things will get on." His only complaints were against the motor vehicle workers. The city motor transport enterprises were obliged to provide 10 dump trucks every day for the project but often there was not a single one.

The Chief of the Directorate for the Construction of the Rail Ferry Projects, P. Yakubavichus, rightly feels that the work is developing slowly. The most important thing which cannot be recovered is being lost, that is, the good summertime. But instead of going to work with your sleeves rolled up, the construction workers are spending more time thinking and deciding. And such extended hesitation is inconceivable. Certainly, the Balttransstroy Trust has adopted socialist obligations to use 4 million rubles during the current year. But as of now only one-fifth has been used. In order to keep within the established construction times, next year they plan to carry out already

8 million in addition to what remains uncompleted now. And with such work a good deal can remain.

The reasons? The poor supply of the project with rails, ties and fastenings. As of today, the collective of the SMP-711 has laid around 6 km of track. They could have done double this.

The leaders of the Baltic Mainline are also concerned by the state of affairs at the project.

"The work, in fact, is getting underway slowly, although we have provided and will provide the necessary help," said the chief of the railroad, I. Yemets. "The time for putting the ferry into operation could be jeopardized thus. With an acute shortage of flatcars, at the request of the construction workers we provided two circuit trains. But they, as you have seen for yourselves, spend more time idle. We have proposed delivering fill from Daugavpils and it was merely a question of loading the equipment and loads in the rollling stock. But as yet the construction workers have not shown any initiative. Certainly the amount of work to be done on the ferry crossing in relation to the time of carrying it out is so great that the coordinated work of the general contractor and its subcontracting organizations must be organized immediately."

Here no time has actually been provided for hesitation. The unique transport facility should go into service simultaneously with the analogous facilities at the port of Mukran. Only under this condition can the ferry crossing operate.

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WORK ON MOSCOW SUBWAY'S NEW TIMIRYAZEVSKAYA LINE UNDER WAY

Moscow TRANSPORTNOYE STROITEL'STVO in Russian No 7, Jul 84 pp 15-17

[Article by Engr I. V. Usenko of Mosmetrostroy: "The Timiryazevskaya Line of the Moscow Subway Under Construction"]

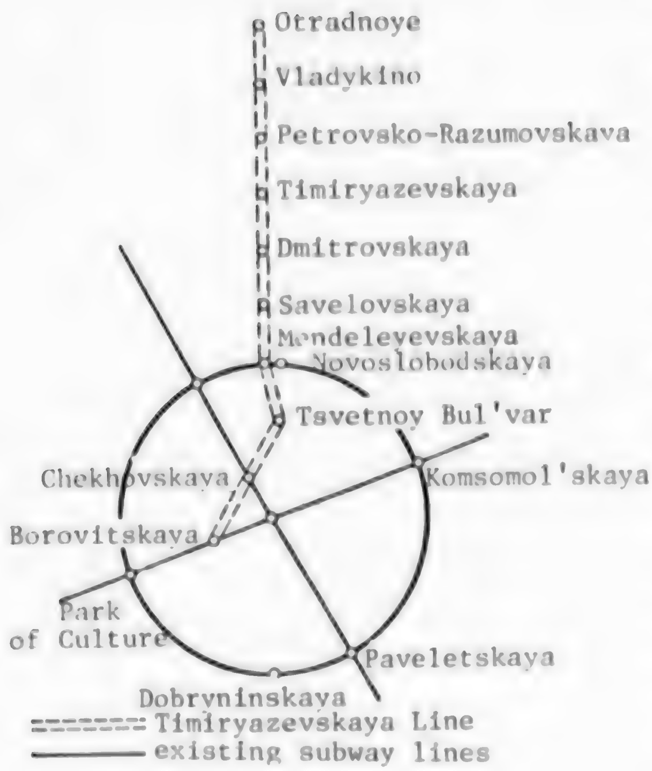
[Text] Mosmetrostroy [Construction Administration for the Moscow Subway] has begun building a new subway line, the Timiryazevskaya. This route together with the existing Serpukhovskaya Line forms the unified Timiryazevsko-Serpukhovskaya Line which links the northern regions of Otradnoye, Bibirevo and Lianozovo with the southern of Chertanovo and Krasnyy Stroitel'. The construction of the line is the next stage in carrying out the General Plan for the Construction and Reconstruction of the Capital.

The plans for the Timiryazevskaya Line were worked out by the institute Metrogiprotrans [?State Design Institute for Subway Transport]. Also participating in the designing of the line were the institutes Mosgiprotrans [Moscow State Design and Research Institute of the USSR Ministry of Transport Construction], Transenergoproyekt [?State Design-Research Institute for Transport Power], Mosinzhproyekt [?Moscow Engineer Design Institute] and Mosenergoproyekt [Moscow Design Institute for the Designing of Power Projects].

The Timiryazevskaya Line starts at the center (see the diagram) from Borovitskaya Station which is simultaneously the initial station of the Serpukhovskaya Line, it runs in the direction of Pushkin Square and Trubnaya [Pipe] Square. From here the route heads toward the Savelovskiy Terminus, crossing the Ring Line at Novoslobodskaya Station. The leg from Borovitskaya to Savelovskiy Terminus runs beneath the area of the capital which has kept the architectural structure of Old Moscow with the confused placement of streets and lanes, with a high development density. Here many buildings are of historical and architectural value as monuments of the 18th-19th centuries. Such a situation requires special care from the subway builders in carrying out the work.

From Savelovskiy Terminus the line crosses a number of railroad routes and terminates at the housing development of Otradnoye.

The direction of the route has been determined from the need to locate the stations in areas of the formation of passenger traffic, at the intersections of major city arteries and by the passenger platforms of the suburban rail service, considering the existing architectural structure as well as the prospects of development.



On the line there will be nine stations. The first station, Chekhovskaya is being built and will be linked with Pushkinskaya and Gorkovskaya Stations by transfer passageways and escalators. The entry to Chekhovskaya Station is to be through an underground vestibule with exits onto Pushkin Street. Subsequently this vestibule will be connected by a second escalator exit with Pushkin Station. The construction of Chekhovskaya Station is already under way.

The pavilion for the following station, Tsvetnoy Bul'var will be next to the Central Market.

At the intersection with the Ring Line, at Novoslobodskaya Station, a transfer station called Mendeleyevskaya will be built. This will provide an opportunity for connecting to the vestibule a second escalator tunnel of Novoslobodskaya Station.

Savelovskaya Station at the terminal of the same name will have two exits--through the southern vestibule to Novoslobodskaya Street and through the northern one to the terminal square. In the long run they plan to connect the northern vestibule directly with the railroad passenger platforms.

Dmitrovskaya Station with two underground vestibules is being built at the intersection of the rail lines of the Rega Route and the Timiryazevskaya under the Dmitrovskaya Highway at the intersection with Fonvizin Street, the Petrovsko-Razumovskaya at the intersection with the tracks of the October Railroad, and Vladykino with wo underground vestibules at the intersection with the Moscow Circular Rail ad at the freight yard of Vladykino. The last station of the line, Otradnoye is being built on the intersection of Severnyy Bul'var with Dekabristov Street as two underground vestibules.

On the Vladykino--Otradnoye leg they will build an electric depot for the subway rolling stock. All stations, due to the conditions of urban planning, are located beneath the transport arteries and have underground vestibules with the exception of Vladykino and Tsvetnoy Bul'var Stations where due to the development conditions the vestibules are in the form of surface pavilions.

The new line will be linked with the existing subway network by transfer connections at Chekhovskaya Station with the Gor'kovskaya-Zamoskvoretskaya Line via the Gor'kovskaya Station, the Zhdanovsko-Krasnopresnenskaya Line via Pushkinskaya Station and with the Ring Line by Novoslobodskaya Station.

In the plans for Petrovsko-Razumovskaya Stations, provision has been made for building transfers to the future line (Degunino--Lyublino). Two stations on the line will have exits to the railroad platforms of the suburban service from Dmitrovskaya Station to the same-named platform of the Rega Line and from Petrovsko-Razumovskaya Station to the platform of the same name of the October Railroad.

The position of the route in profile has been determined by the engineering and geological situation, by the urban development conditions and by the requirements for bypassing the existing and designed subway installations on various levels as well as the presence of municipal underground utilities. In line with this, the entire line from Borovitskaya Station to Petrovsko-Razumovskaya Station, inclusively, has been designed to run deep. The stations of Vladykino and Otradnoye and a portion of the tunnels connecting to them as well as the spur to the car depot will be built by the open method, in trenches.

The average distance between stations is 1.7 km and the maximum is 2 km.

According to calculations the size of the population living in the area gravitating to the subway on the Novoslobodskaya--Otradnoye leg is around 600,000 persons and around 200,000 persons work in this zone. On the Borovitskaya--Novoslobodskaya leg some 560,000 persons live in the zone of gravitation.

In line with the mass housing construction and the development of large residential areas in the northern zone of the capital, in the regions of Bibirevo and Otradnoye through which the Timiryazevskaya Line will run as well as in the areas of Degunino, Beskhudnikovo and Lianozovo (during the 11th Five-Year Plan in the northern zone they plan to complete around 3.6 million m^2 of housing), the Timiryazevskaya Line will be unable to satisfy the transport needs of the public from these areas and the need will arise to provide these rapidly developing peripheral areas with mass urban transport. For solving this problem there are plans to build an eighth subway line which will run through the areas of Beskudnikovo, Degunino and Korovino, it will intersect the Timiryazevskaya Line at Petrovsko-Razumovskaya Station and then the Ring Subway Line, then across the central zone of the city will reach Kursk Terminus and then run toward Pechatniki--Lyublino, Marino, Brateyevo.

The architectural layout and the artistic designing of the stations and vestibules of the Timiryazevskaya Line have been subordinate to the basic demands of designing, that is, to create politically-oriented, highly artistic works by the creative collaboration of architects, sculptors and artists so that each station has its own appearance, its own individual memorable design while the layout of the stations, vestibules, entries, exits, transfer and other passageways should provide maximum convenience for the passengers and their spending of a minimum time for the trip as a whole.

The artistic themes of the stations are diverse and significant in content. The design of the station named after A. P. Chekhov is devoted to the memory of this great Russian writer. The severe lines of the columns and arches faced in light-colored marbles set off the bronze portrait sculpture of the writer. Circus art in the USSR will tentatively become the theme for the design of the Tsvetnoy Bul'var Station. The design of Mendeleyevskaya Station of the column type will be devoted to the genial Russian chemist D. I. Mendeleyev.

"The History of Rail Transport" is the design theme for the pylon Savelovskaya Station. The corresponding panels will be placed on the track walls of the station.

At Dmitrovskaya Station also of the pylon type there are plans to install mosaic wall panels on the theme "The Defeat of the Nazi Troops at Moscow in 1941." The design theme for Timiryazevskaya Station is "Nature and Man." The Petrovsko-Razumovskaya Station of the column type is to be designed around the theme "The History and Achievements of Soviet Agricultural Science." Wall panels and bas reliefs will be the means for expressing the theme.

The architectural and artistic design of the column-type Vladykino Station which is to be built by the open-pit method is to be devoted to the development of sports in the USSR. The "Decembrists" is the theme of the decorative artistic wall panels which are to be installed on the track walls of the single-arch Otradnoye Station being built by the open-pit method.

Traditional materials will be used for the architectural details and finishing: for the floors of the stations and vestibules, the bases of the track walls and columns--polished granite of varying hue from the Ukraine and Karelia, marbles from Georgia and Uzbekistan, ceramic tile, anodized and shaped nonferrous metal including aluminum and brass as well as cast bronze.

The construction of the Timiryazevskaya Line reflects the achievements of Soviet subway construction and the developments of the specialized scientific research and design institutes.

The plans provide for the use of progressive structural elements, highly productive paneling equipment and mechanized complexes as well as new types of economic and highly dependable electrical equipment. New dependable and economic traffic control systems are being developed.

For the construction of the tunnels, they will employ the new mechanized tunnel shield of the KT-1 5.5D2 type. This shield is equipped with changeable working parts for cutting rock of varying strength and due to this maneuverability is increased and cutting work becomes less dependent upon the geological conditions. Use of this shield, according to preliminary data, will reduce labor expenditures on building 1 km of tunnel by 1,200 man-days with a saving of 300,000 rubles. Extensive use will be made of the forcing through of the tunnels under the railroad tracks, the freezing of ground combined with lowering the water table. The track has been designed employing R65 rails with insulating glued-bolt joints. The rails are welded into lengths 250 m long. For the first time under Moscow conditions, the construction of the underground pedestrian passageways from the underground vestibules will be made using all-sealed sections.

For ensuring traffic safety within the set throughput capacity (48 pairs of trains an hour), the line is being built with automatic speed control (ARS) and automatic train control (AUP) systems combined with dispatcher signaling for the switches and signals. The ARS and AUP equipment will have a high degree of reliability and make it possible to control the train with one engineer without an assistant and the activities of the engineer are limited basically to carrying out monitoring functions.

In building the line, provision is being made to carry out measures for environmental conservation. The basic measure, in addition to the compulsory treatment of waste water, is the protection of nearby residences from noise and vibration created by the operating subway equipment. In line with this they are installing noise and vibration abatement screens, the tracks are being laid on rubberized-metal gaskets, the velocity of the air currents for the basic tunnel ventilation is being reduced and other measures are being carried out to reduce the intensity of the arising noise and vibration.

The construction of the Timiryazevskaya Line should be completed in the next five-year plan with its opening up in three stations.

The first complex to be completed will include the section from Borovitskaya Station to Chekhovskaya Station including one station, Chekhovskaya. The early completion of Chekhovskaya Station with the construction of transfers at Gor'kovskaya Stations will solve an important problem of providing direct service for the existing Serpukhovskaya Line with the center of the city and reaching Gor'kovsko-Zamoskvoretskaya and Zhdanovsko-Krasnopresnenskaya Lines.

In the second stage they will put into operation the section from Chekhovskaya Station to Savelovskaya Station with three stations: Tsvetnoy Bul'var, Mendeleyevskaya and Savelovskaya.

The completion of the third section from Savelovskaya Station to Otradnoye Station with five stations will conclude the building of the line.

During the first operating period, on the line 40 pairs of 8-car consists will be operated during the peak hours and subsequently 48 pairs.

Construction of the line has commenced on the entire route. The construction sites are being cleared and developed, preparatory work is underway and the mine shafts are being sunk. Construction has commenced at Chekhovskaya Station and the cutting of the tunnels on the Borovitskaya--Chekhovskaya section. Some of the first on the route of the new line are the subway builders from Tunnel Detachment No 6 which is to build the line tunnels between Chekhovskaya and Tsvetnoy Bul'var Stations. At work here is the integrated brigade of Hero of Socialist Labor, P. A. Novozhilov. It has already sunk the shaft column and has begun to cut the tunnels. The cutting of the tunnels and the building of the stations have commenced also on the remaining sections of the line.

10272
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PORTS AND TRANSSHIPMENT CENTERS

RECENT IMPROVEMENTS IN NOVOROSSIYSK PORT FACILITIES

Moscow MORSKOY FLOT in Russian No 7, Jul 84 pp 16-19

[Article by V. Deruzhinskiy: "Labor Productivity Is Foremost"]

[Excerpt] In recent years the Novorossiysk port has been developing rapidly and it has now turned into a major economic complex that processes various types of cargo. The complex has first-class facilities. The port includes the Central, Western and Eastern dry cargo sections in addition to the petroleum port Sheskharis. Modern ships from more than 80 countries are moored at the port's berths. Every year the port handles upward of 1,500 arrivals of foreign and Soviet ships. General cargo, bulk cargo, bulk oil and other types of cargo comprise the basis of port exports and imports.

The port work force has done and continues to do much to increase port traffic capacity and to introduce new technology and technically advanced units for the processing of general, bulk and bulk oil cargo.

In the Western Section of the port a new specialized berth came into operation in 1981 for the processing of ro-ro ships with storage space for containers and automotive materiel. Its yearly capacity is about 260,000 tons of cargo. The loading and unloading of wheeled equipment is completely mechanized. In 1983 a blower-loader to handle loose, granular cargo was put into operation; it has a capacity of 150 tons per hour.

In the Central Section of the port, a machine was put into operation in 1983 to pack bagged cargo: this made it possible to significantly raise labor productivity. The all-weather unit operates continuously and it has specialized storage facilities. The unit makes it possible to process up to 1 million tons of raw sugar yearly.

A unit for bulk loading of cement onto ships operates in the Eastern Section of the port. A blower-loader has been put into operation here with a capacity of 300 tons per hour to handle loose, granular cargo.

The deep water bulk petroleum berth in the Sheskharis petroleum section makes it possible to process tankers with carrying capacity up to 250,000 tons. The outstanding quality of the new unit is its high petroleum unloading capacity (20,000 tons per hour). The berths of this section are equipped with

automated and telemetric systems, and tanker processing is controlled by computers.

In 1983 a hydraulic structure was put into operation. It is intended for the lowering, raising and storing of floating barriers. Its use made it possible to take efficient measures to localize and collect accidentally spilled petroleum products.

The comprehensive development of the material and technical facilities of the port overall together with advanced technology and organization of loading and unloading operations has made it possible for the Novorossiysk port workers to successfully cope with the fulfillment of their economic plans and socialist obligations. Thus, the 3-year plan of the 11th Five-Year Plan for the processing of cargo was fulfilled by 110.3 percent and for profitability by 105.1 percent. About 50,000 ship/hours of turnaround time were saved. The overall tempo and the rate of cargo operations have substantially increased.

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FIRST PERMANENT BERTH OPERATIONAL AT MUUGA PORT SITE

[Editorial Report] Tallinn SOVETSKAYA ESTONIYA in Russian on 5 October carries on page 1 a report on the opening of the first permanent berth facilities at the Muuga Port construction site. Work began on the facilities in February of 1983, and the official opening was held at the end of September, a full quarter ahead of schedule. The berth, 135 meters in length, includes an access road and a pumping station. Its 150,000-ton yearly capacity is intended for processing mineral construction materials, such as sand from Kaliningrad and gravel from Karelia, as well as "equipment from Helsinki." The article notes in conclusion that facilities for handling refrigerated cargoes are scheduled for completion by November of 1985.

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